(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number : **0 498 607 A2**

(12) EUROPEAN PATENT APPLICATION

(21) Application number : **92300914.6**

(51) Int. Cl.^{5} : **G11B 23/03**

(22) Date of filing : **04.02.92**

(30) Priority : **05.02.91 US 650851**

(43) Date of publication of application :
12.08.92 Bulletin 92/33

(84) Designated Contracting States :
AT BE CH DE DK ES FR GB GR IT LI LU NL PT SE

(71) Applicant : **HOECHST CELANESE CORPORATION**
Route 202-206 North
Somerville, N.J. 08876 (US)

(72) Inventor : **Hughes, Patrick M.**
47 Quarry Ridge Road
Clinton, New Jersey (US)
Inventor : **Fletcher, Maribeth**
4409 Hatch Lane
Lisle, Illinois (US)

(74) Representative : **De Minvielle-Devaux, Ian Benedict Peter**
CARPMAELS & RANSFORD 43, Bloomsbury Square
London WC1A 2RA (GB)

(54) Shutters with integrally molded spring elements for flexible magnetic disc cassettes.

(57) A flexible magnetic disc cassette includes a cassette case formed of a molded plastics material defining an interior space and a window which opens thereinto. A flexible magnetic disc having a central hub is rotatably accommodated with the interior space of the cassette case such that the magnetic disc is exposed beneath said cassette case window. A shutter formed of a plastics material (which may be the same or different than the plastics material form which said cassette case is formed) straddles an edge of the cassette case adjacent to its defined window. The shutter is reciprocally movable along the edge between a closed position (wherein said shutter covers the window) and an opened position (wherein the shutter exposes the window to allow access to said magnetic disc therebeneath). According to the invention disclosed herein, an elongate spring element is integrally molded (unitary) with either the cassette case or the shutter and so as to occupy a position within a corner pocket of the cassette case. The integral spring exerts a bias force against the shutter in a direction which encourages the shutter to move into its closed position.

EP 0 498 607 A2

FIELD OF INVENTION

The present invention relates generally to cassettes for flexible sheet-like discs of magnetic media. More specifically, the present invention relates to improved cassette constructions for flexible magnetic discs whereby a shutter is provided with an integrally molded spring element.

BACKGROUND AND SUMMARY OF THE INVENTION

Flexible sheet-like magnetic discs having a nominal standardized size of about 3.5 inches are widely used in a variety of data storage/retrieval systems. For example, cassettes which include flexible magnetic discs are used in conjunction with personal computers so as to load data and/or programs into the central processing unit of the computer, as well as to store data in an off-site location in a more convenient manner.

When placed into service in a magnetic recording/reproducing apparatus, the magnetic disc (which is accommodated for rotational movement within the interior of the cassette case) is caused to spin relative to a magnetic read/write head by means of a motor-driven spindle coacting with an aperture in the central hub of the magnetic disc. The spindle, moreover, serves to center the magnetic disc relative to the magnetic read/write head so that accurate placement and retrieval of data onto and from the disc will ensue.

The cassette case for the magnetic disc is typically formed with radially elongate (relative to the magnetic disc) access windows -- usually on opposing sides of the cassette case so that data magnetically stored on each side of the magnetic disc can be accessed by respective read/write heads associated with the magnetic recording/reproducing apparatus. Protection against inadvertent scratching of the magnetic disc surface and/or accumulation of dust is afforded by means of a relatively thin inverted U-shaped shutter mechanism that is movable along the edge of the cassette case adjacent to the access windows. Thus, the shutter opens and closes the access windows when the disc is placed in service within and removed from, respectively, the magnetic recording/reproducing apparatus. Movement between these opened and closed positions is facilitated by means of a separate spring element (typically formed of a small gauge, but relatively stiff, wire) which exerts a bias force in a direction tending to move the shutter into its closed position.

As can be appreciated, during assembly of flexible magnetic disc cassettes, the separate handling of the spring element necessarily translates into additional labor during cassette manufacturing -- hence, increased production costs. Furthermore, handling of the spring element itself is quite tedious due to its relatively small size thereby leading to increased possibility of incorrect positioning of the spring element during assembly of the magnetic disc cassette. Incorrectly positioned spring elements could, in turn, lead to improper performance of the shutter mechanism during use. Accordingly, when incorrectly positioned spring elements are detected during the manufacturing process, the entire cassette is usually rejected – again leading to increased production costs.

According to the present invention, however, shutter elements formed of a plastics material are provided with an integrally molded (unitary) spring element. Thus, separate handling and/or manipulation of the shutter and spring element during assembly of the magnetic discelement is avoided. As a result, the cassettes may be assembled with greater speed and accuracy as compared to conventional cassettes which employ structurally separate shutter mechanisms and spring elements.

The shutter according to the present invention is a relatively thin (e.g., a thickness of between about 0.012" to 0.022", preferably 0.015") inverted U-shaped structure having a base and a pair of depending walls which, like conventional shutters, straddle an upper edge region of the cassette case adjacent to the magnetic disc access windows. The base thus reciprocally moves along the cassette edge so that the depending walls likewise move parallel to respective surfaces of the cassette so that windows defined in the walls are capable of registry with respective one of the access openings when the shutter is in its opened condition.

An elongate spring element is integrally molded to (i.e., one-piece structure with) the base of the shutter. Most preferably, the integrally molded spring element extends longitudinally outwardly from the base of the shutter and terminates in a free end that coacts with a stop molded into the interior of the cassette. The stop thus serves to positionally fix the free end so that when the shutter is moved in a direction towards the stop, the resiliency of the spring element will translate into a bias force being exerted upon the shutter in an opposite direction. The spring element could, however, be integrally molded into the cassette itself, in which case the stop is associated with the shutter.

Further aspects and advantages of this invention will become more clear after careful consideration is given to the detailed description of the preferred exemplary embodiments thereof which follow.

BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS

Reference will hereinafter be made to the accompanying drawings wherein like reference numerals throughout the various FIGURES denote like structural elements, and wherein;

FIGURE 1 is a perspective view of a flexible magnetic disc cassette that includes a movable shutter according to the present invention;

FIGURE 2 is a side elevational view of one embodiment of a shutter according to the present invention particularly showing the integrally molded spring element thereof;

FIGURE 3 is a latitudinal cross-section of the shutter shown in FIGURE 2 as taken along line 3-3 therein;

FIGURE 4a is a partial longitudinal cross-section particularly showing the interaction between the integrally molded spring element of the shutter and the cassette case when the former is in its closed position;

FIGURE 4b is a partial longitudinal cross-section similar to FIGURE 4a, but showing the shutter in its opened position;

FIGURE 5 is an alternative embodiment according to the present invention whereby the spring element is integrally molded with the magnetic cassette case and extends towards the shutter;

FIGURE 6 is a side elevational view of another embodiment of the shutter with integrally molded spring element according to the present invention;

FIGURE 7a is a partial longitudinal cross-section particularly showing the interaction between the integrally molded spring element of the shutter according to the embodiment depicted in FIGURE 6 and the cassette case when the former is in its closed position;

FIGURE 7b is a partial longitudinal cross-section similar to FIGURE 7a, but showing the shutter in its opened position.

DETAILED DESCRIPTION OF THE PREFERRED EXEMPLARY EMBODIMENTS

Accompanying FIGURE 1 shows a preferred embodiment of a flexible magnetic disc cassette 10 according to the present invention. The cassette 10 shown in FIGURE 1 is, moreover, configured according to accepted industry standards for nominal 3.5-inch discs. In this regard, the cassette 10 includes a cassette case 12 having upper and lower cassette case halves 12a, 12b, respectively, joined to one another along their peripheral edges, for example. The lower cassette case half 12b defines an enlarged opening 12c which accommodates a drive carriage (not shown) associated with a conventional magnetic recording/reproducing apparatus. The drive carriage will also include a centrally located spindle (not shown) which coacts with the drive aperture 14a associated with the central hub 14 of the magnetic disc MD.

The preferred cassette case 12 according to the present invention includes a movable shutter 16. In this regard, the shutter 16 is formed unitarily of a plastics material and is generally of an inverted U-shape in cross-section. That is, shutter 16 includes a base 16a positioned adjacent the edge 12d of cassette case 12 which is nearest the access openings 18a, 18b. A pair of depending walls 16b, 16c unitarily joined along their upper edges to the base 16a therefore straddle the edge 12d of the cassette case 12. Most preferably, recessed surfaces are formed in the cassette case so as to accomodate the thickness of the shutter walls 16b, 16c to thereby establish an essentially smooth coplanar exterior surface for the cassette (see in this regard one such recessed surface 12d formed in the lower cassette case half 12b in FIGURE 1).

The shutter walls 16b, 16c each define respective windows 16d, 16e which are moved into registry with openings 12e (only one such opening 12e being shown in FIGURE 1) when the shutter is moved into its opened position (i.e., in the direction of arrow 20). Movement of the shutter 16 into its opened position typically happens automatically when the cassette 10 is inserted into the input slot of a magnetic recording/reproducing apparatus. The magnetic read/write head of such recording/reproducing apparatus may thus be brought into operative association with the magnetic disc MD by virtue of the registry of the shutter windows 16d, 16e and the cassette case openings 12d.

The shutter 16 is biased in a direction towards its closed position (i.e., in a direction opposite to arrow 20 via an integrally molded spring element 22. As is perhaps more clearly seen in accompanying FIGURES 2 and 3, the spring element 22 is integrally molded with the shutter 16 such that it is a unitarily joined to the shutter base 16a at its end 22a. The spring element 22 extends longitudinally outwardly from the shutter base 22a and terminates in a free end 22b. A stress relief surface (preferably arcuate, and most preferably conforming to the generatrices of a right cylinder) is formed midway of the ends 22a and 22b so as to decrease the stiffness/increase the resilience at the joint 22d. Moreover, the stress relief surface 22c also establishes a pair of spring arms 22e, 22f.

It will also be observed in FIGURES 2 and 3 that the shutter 16 includes vertical and horizontal guide bosses 16f and 16g, respectively, which are preferably integrally molded with the shutter 16 and extend into the shutter's interior space. The vertical guide boss 16f is sized and configured so as to fit within the slot 12f formed in the top edge 12d of cassette 12 between the cassette halves 12a, 12b. The horizontal guide bosses 16g, on the other hand, are sized and configured so as to fit within the channel 12g extending parallel to the edge 12d and defined in the cassette half 12b. These guide bosses 16f and 16g serve to maintain the position of the shutter 16 during reciprocal movements between its closed and opened

positions. In addition, the interaction between the horizontal boss 16g and the channel 12g prevent the shutter 16 from being easily removed from its operative position with the cassette case 12.

Accompanying FIGURES 4a and 4b show the functional interaction between the integrally molded spring 22 and the upper cassette case half 12a when the shutter 16 is in its closed and opened positions, respectively. FIGURES 4a and 4b are shown with the cassette case half 12b being removed for clarity of presentation. It will be understood however that although FIGURES 4a and 4b are shown only in relation to the cassette half 12a, the other cassette half 12b is essentially a mirror image thereof. Thus, the cassette halves 12a, 12b serve to encase the integral spring element 22 when the cassette case 12 is fully assembled.

As is shown in FIGURES 4a and 4b, the free terminal end 22b of spring element 22 is received within a molded interior stop 24 which serves to positionally fix (immobilize) the end 22b of spring element 22 relative to the cassette case 12. The arms 22e, 22f of the spring element 22 will thus be positioned within an interior corner pocket 26 of the cassette case 12 defined by the opposing cassette case halves 12a, 12b. It will be appreciated that the pocket 26 in which the spring element 22 is positioned must be laterally disposed relative to the circular interior space 28 of cassette case 12 which is occupied by the magnetic disc MD. Since the cassette case 12 according to industry standards has a rectangular (square) geometry and the magnetic disc is circular, the pocket 26 most conveniently is formed in a corner of the cassette case 12 near the upper edge 12d.

In its closed position (as shown in FIGURE 4a), the spring element will be substantially fully extended and thereby will be nearly in a completely relaxed state. However, complete relaxation of the spring element 22 should be avoided if possible since it is desirable to maintain a small but meaningful bias force against the shutter 16 to ensure that it positively seats in its closed position, and to ensure that the shutter 16 stays in its closed position during normal manipulation of the cassette 10.

Movement of the shutter 16 into its opened position (as shown in FIGURE 4b) will cause the legs 22e, 22f to be displaced resiliently into a closer adjacent relationship with one another via a pivot action about joint 22d. Since the spring element 22 is integrally molded of the same resilient plastics material as the shutter 16, it will have a tendency to return to its "normal" position, which in this embodiment is the opened position of the shutter 16 as shown in FIGURE 4a. Hence, movement of the shutter 16 into the closed position will be effected against the bias force of the spring element 22. That is, force of the spring element 22 will be essentially "loaded" when the shutter 16 is in its opened position, thereby causing the shutter to move back into its closed position when the shutter 16 is released.

Accompanying FIGURE 5 shows an alternative embodiment according to the present invention. In this regard, it will be observed that the spring element 30 in FIGURE 5 is integrally molded (unitary) with the cassette case half 12a. Of course, the spring element 30 could likewise be integrally molded with the other cassette case half 12b, if desired. In the embodiment shown in FIGURE 5, the shutter 32 is formed with a molded stop 32a which received the terminal free end 30a of spring element 30. The end 30b opposite to the free end 30a is therefore unitary with the cassette half 12a. Similar to the spring element 22 described previously, the spring element 30 according to this embodiment will likewise be formed with a stress relief surface 30c at joint 30d which establishes spring arms 30e, 30f. Movement of the shutter 32 from its closed position as shown in FIGURE 5 towards its opened position will thereby be against the bias force of the spring element 30. Therefore, similar to the embodiment described previously, the shutter 32 will be biased into its closed position via the spring element 30 integrally molded with the cassette case half 12a.

Another embodiment of a shutter 16' according to this invention is shown in accompanying FIGURES 6 and 7a-7b. As is especially apparent in FIGURE 6, the shutter 16' is quite similar to the shutter 16 described above with reference to FIGURES 2-3 and 4a-4b. Thus, like structures as between these embodiments will not again be described in detail here. However, like structures in the embodiment shown in FIGURES 6 and 7a-7b will be identified by the same reference numerals as used in FIGURES 2-3 and 4a-4b, but with a following prime (') designation.

As is seen particularly in FIGURE 6, the shutter 16' includes an integrally molded (unitary) spring element 40 having multiple legs 40a-40d sequentially joined to one another via joints 22e-22g so that the legs 40a-d generally follow a serpentine configuration. Stress relief surface 22h-22j, like stress relief surface 22c described above, are provided so as to increase the resiliency (decrease stiffness) of the spring element 40 so that it exerts the desired bias force to the shutter 16'.

One end 40k of the spring element 40 is integrally molded with the shutter 16' at wall 16a', whereas the opposite free terminal end 401 of the spring element 40 is an angular extension of leg 40d and serves to mate with stop 24' integrally molded with cassette case half 12a' (and/or with the other cassette case half). The interaction between the terminal end 401 of spring element 40 and the stop 24' positionally fixes the end 401 and thereby provides ensures that the spring force inherent in the spring element 40 will be realized when the shutter 16' is moved from its closed position (as shown in FIGURE 7a) into its opened position (as shown in FIGURE 7b).

It will be observed in this regard, that in the closed position (FIGURE 7a), the legs 40c and 40d are more closely adjacent one another as compared to legs 40a and 40b. Thus, the tendency of legs 40c and 40d to pivotally move away from one another imparts a slight (but desirable) bias force to the shutter 16' to positively maintain the same in its closed position. On the other hand, when the shutter 16' is in its opened position (FIGURE 7b), the legs 40a and 40c are resiliently displaced closer to their corresponding legs 40b and 40d, respectively, with the greater resilient displacement occurring between legs 40a and 40b. Thus, when in its opened position, the spring element 40 is at or near its,maximum bias force so that when the shutter 16' is released, positive sliding movement of the shutter 16' back into its closed position occurs.

A major portion of the resiliency of the spring elements discussed above is provided by means of the plastics material from which the shutter and spring are formed. In this regard, the preferred plastics material is an oxymethylene polymer having repeating oxymethylene ($-CH_2O-$) units. The oxymethylene polymers that may be satisfactorily employed according to the present invention can be either homopolymers (i.e., comprised solely of recurring oxymethylene units, exclusive of endcapping units), or copolymers (i.e., comprised mainly of recurring oxymethylene units randomly interspersed with higher oxyalkylene (preferably oxyethylene) units, exlusive of endcapping units). The preferred oxymethylene homopolymers may be made using the techniques disclosed in U.S. Patent No. 2,768,994 to MacDonald, whereas the preferred oxymethylene copolymers may be made using the techniques disclosed in U.S. Patent No. 3,027,352 to Walling (the entire content of each being expressly incorporated hereinto by reference).

Oxymethylene copolymers comprised mainly of recurring oxymethylene units interspersed with oxyethylene units are especially preferred. The most preferred oxymethylene copolymers are Celcon® oxymethylene copolymers commercially available from Hoechst Celanese Corporation, Engineering Plastics Division, Short Hills, New Jersey. Most preferred is Celcon® Grade MM3, 5C polyoxymethylene copolymer.

If desired, the oxymethylene polymers may include additives typically employed in engineering resin compositions. Some of the additives that may be incorporated into oxymethylene polymere include antioxidants, UV stabilizers, free radical scavengers, lubricants, fillers, reinforcing media (e.g, glass fibers), colorants, and the like.

The preferred oxymethylene copolymer will possess a tensile strength (ASTM D638) at break of between 7600-8300 psi; an elongation (ASTM D638) at break of between 40-75%; a tensile yield strength (ASTM D638) of between 8800-10400 psi; a compressive strength (ASTM D695) of about 16000 psi @ 10%; a flexural strength (ASTM D790) of about 13000 psi; and a tensile modulus (ASTM D638) of between 410-464 x 10^3 psi.

While the invention has been described in connection with what is presently considered to be the most practical and preferred embodiment, it is to be understood that the invention is not to be limited to the disclosed embodiment, but on the contrary, is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the appended claims.

Claims

1. A shutter to close an opening formed in a flexible magnetic disc cassette comprising:

   a shutter body formed of a molded plastics material, and having a generally inverted U-shaped cross-section; and

   an elongate spring element having one end which is integrally molded with said shutter body and thereby formed of said plastics material, said spring element having a terminal free end opposite said one end, wherein said spring element extends longitudinally outwardly from said shutter body between said one and terminal ends thereof.

2. A magnetic disc cassette shutter as in claim 1, wherein said elongate spring element includes a plurality of legs joined sequentially joined to one another at respective joints so as to allow for resilient displacements therebetween.

3. A magnetic disc cassette shutter as in claim 2, wherein said elongate spring element includes at least one pair of of said legs.

4. A magnetic disc cassette shutter as in claim 2, wherein said spring element includes stress relief surfaces formed at each of said joints.

5. A magnetic disc cassette shutter as in claim 4, wherein said stress relief surfaces are each arcuate.

6. A magnetic disc cassette shutter as in claim 5, wherein each said stress relief surface each conforms to the generatrices of a right cylindrical surface.

7. A magnetic disc cassette as in claim 1, wherein said shutter body and said spring element are integrally molded from an oxymethylene polymer.

8. A magnetic disc cassette shutter as in claim 7,

wherein said oxymethylene polymer is an oxymethylene copolymer comprised mainly of repeating oxymethylene units randomly interspersed with higher oxyalkylene units.

9. A magnetic disc cassette shutter as in claim 8, wherein said higher oxyalkylene units are oxyethylene units.

10. A flexible magnetic disc cassette comprising:

a cassette case formed of a molded plastics material defining an interior space and an opening which opens into said interior space;

a flexible magnetic disc having a central hub rotatably accommodated with said interior space of said cassette case such that said magnetic disc is exposed beneath said opening of said cassette case; and

a shutter formed of a plastics material which may be the same or different from the plastics material form which said cassette case is formed, said shutter straddling an edge of said cassette case adjacent to said defined opening and being reciprocally movable between an closed position wherein said shutter covers said opening thereby closing the same, and an opened position wherein said shutter exposes said opening to allow access to said magnetic disc therebeneath, and

an elongate spring element positioned within a corner pocket of said cassette case and exerting a bias force against said shutter in a direction which encourages said shutter to move into said closed position, wherein

said elongate spring is integrally molded at one end thereof to one of said shutter and said cassette case.

11. A magnetic disc cassette as in claim 10, wherein said spring element is integrally molded with said cassette case.

12. A magnetic disc cassette as in claim 10, wherein said spring element is integrally molded with said shutter.

13. A magnetic disc cassette as in claim 12, wherein said elongate spring element includes a plurality of legs joined sequentially joined to one another at respective joints so as to allow for resilient displacements therebetween.

14. A magnetic disc cassette as in claim 13, wherein said spring element includes one end integrally molded to said shutter, and an opposite free terminal end, and wherein said cassette case includes a stop disposed within said corner pocket for positionally fixing said terminal end of said spring element relative to said cassette case.

15. A magnetic disc cassette shutter as in claim 13, wherein said elongate spring element includes at least one pair of of said legs.

16. A magnetic disc cassette shutter as in claim 15, wherein said spring element includes stress relief surfaces formed at each of said joints.

17. A magnetic disc cassette shutter as in claim 16, wherein said stress relief surfaces are each arcuate.

18. A magnetic disc cassette shutter as in claim 17, wherein each said stress relief surface each conforms to the generatrices of a right cylindrical surface.

19. A magnetic disc cassette as in claim 12, wherein said shutter and spring element are integrally molded from an oxymethylene polymer.

20. A magnetic disc cassette shutter as in claim 19, wherein said oxymethylene polymer is an oxymethylene copolymer comprised mainly of repeating oxymethylene units randomly interspersed with higher oxyalkylene units.

21. A magnetic disc cassette shutter as in claim 20, wherein said higher oxyalkylene units are oxyethylene units.

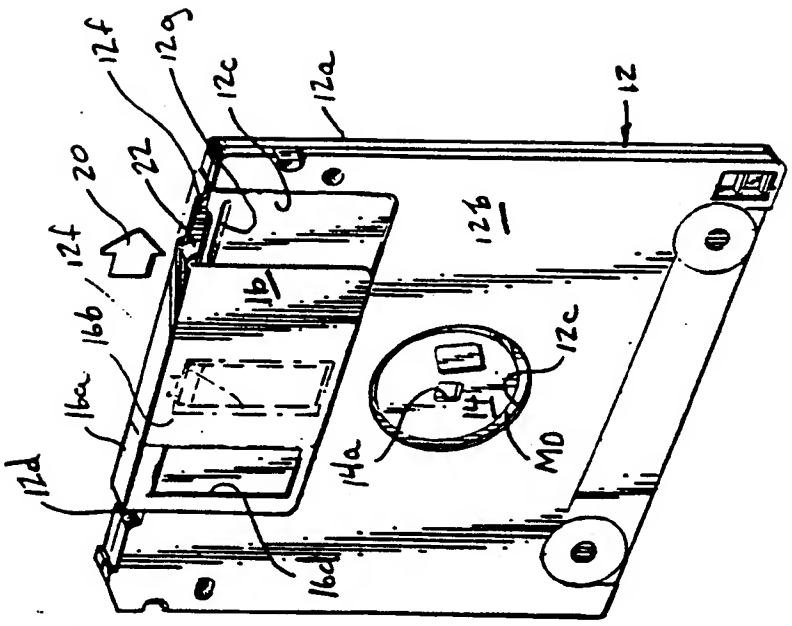


Fig. 1

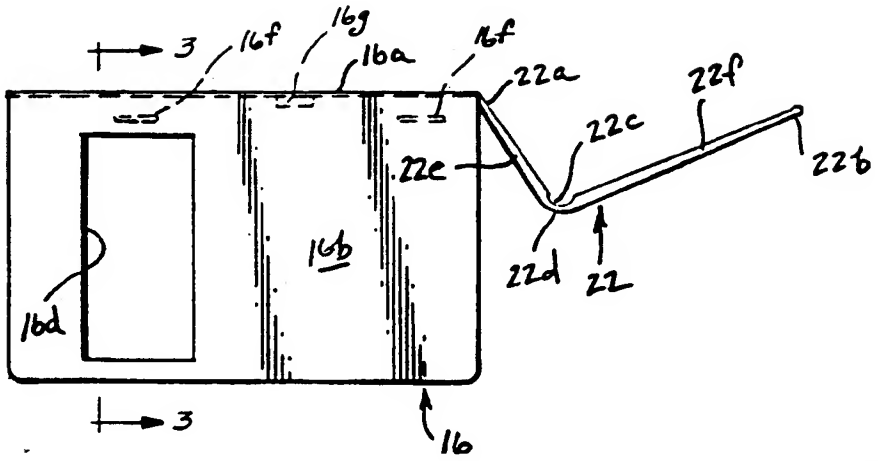


Fig. 2

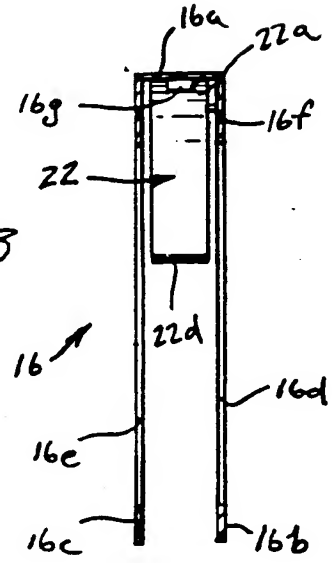


Fig. 3

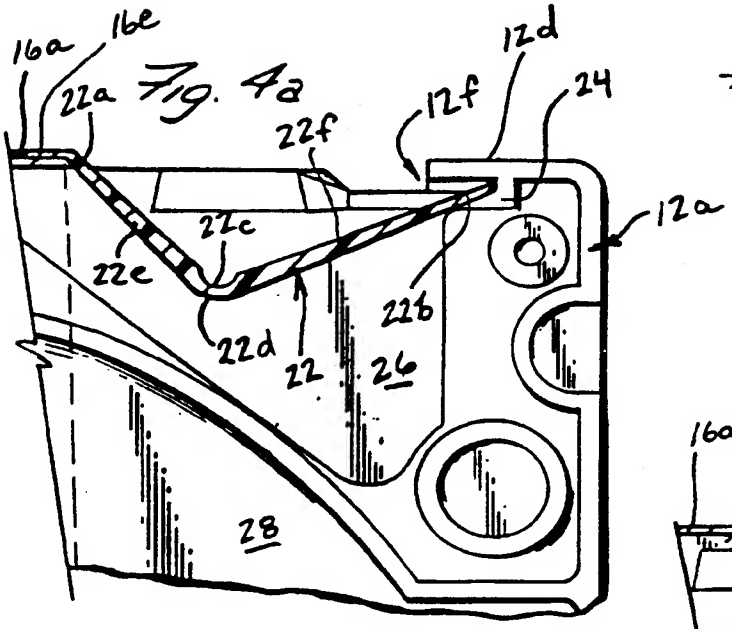


Fig. 4a

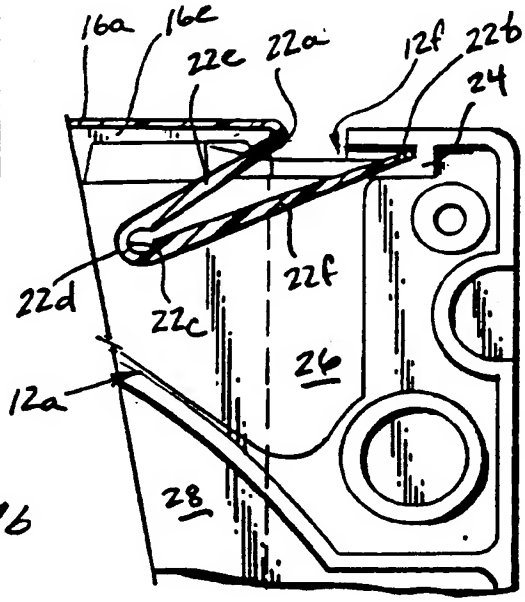


Fig. 4b

Fig. 5

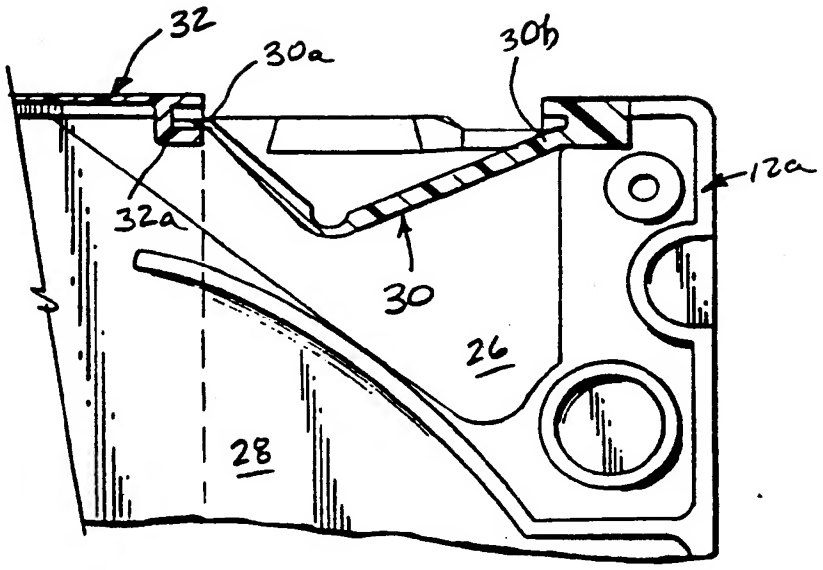


Fig. 6

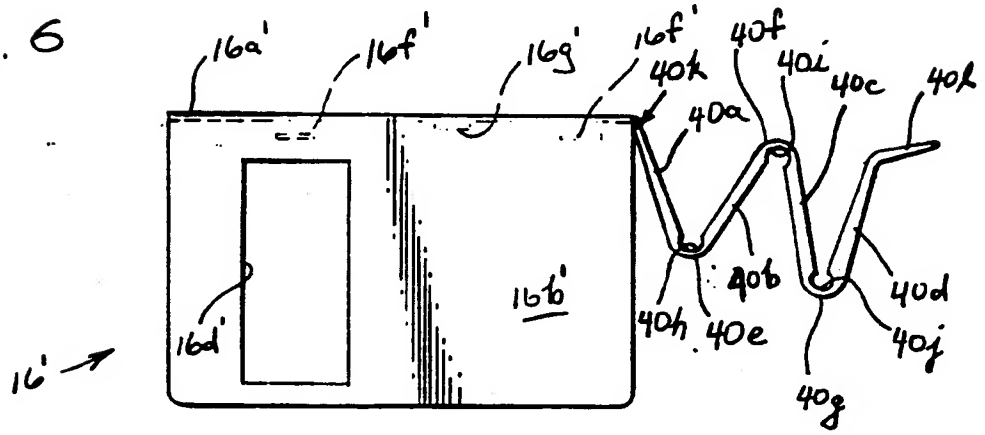


Fig. 7a

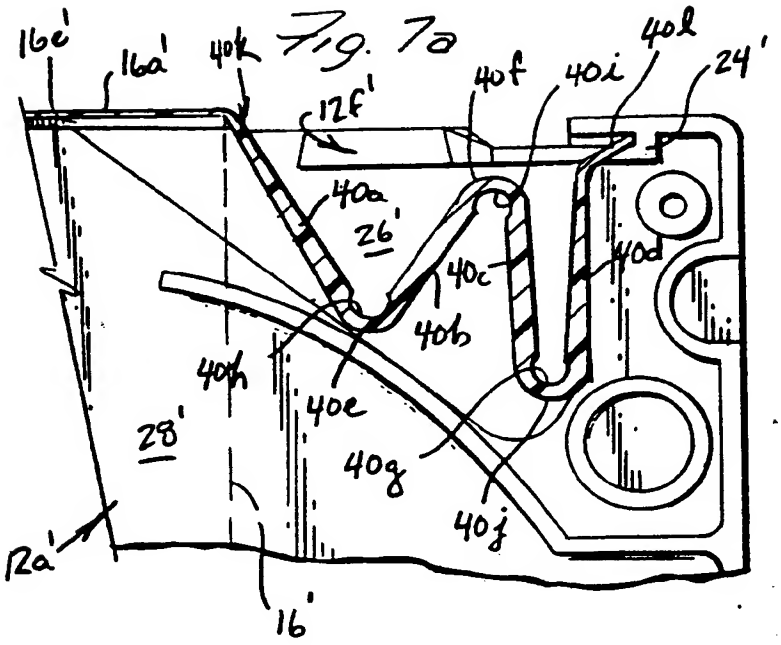
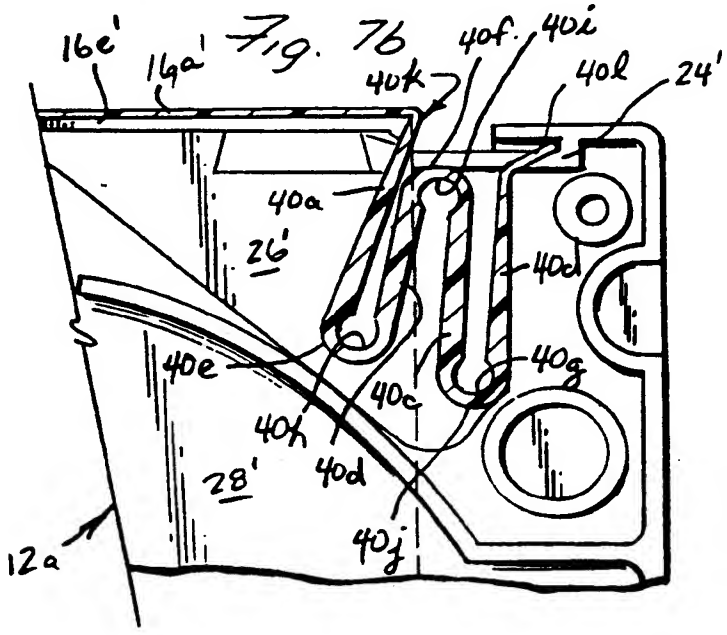


Fig. 7b



(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number : **0 498 607 A3**

(12) EUROPEAN PATENT APPLICATION

(21) Application number : **92300914.6**

(22) Date of filing : **04.02.92**

(51) Int. Cl.^{5} : **G11B 23/03**

(30) Priority : **05.02.91 US 650851**

(43) Date of publication of application :
12.08.92 Bulletin 92/33

(84) Designated Contracting States :
AT BE CH DE DK ES FR GB GR IT LI LU NL PT SE

(88) Date of deferred publication of search report :
09.06.93 Bulletin 93/23

(71) Applicant : **HOECHST CELANESE CORPORATION**
Route 202-206 North
Somerville, N.J. 08876 (US)

(72) Inventor : **Hughes, Patrick M.**
47 Quarry Ridge Road
Clinton, New Jersey (US)
Inventor : **Fletcher, Maribeth**
4409 Hatch Lane
Lisle, Illinois (US)

(74) Representative : **De Minvielle-Devaux, Ian Benedict Peter**
CARPMAELS & RANSFORD 43, Bloomsbury Square
London WC1A 2RA (GB)

(54) Shutters with integrally molded spring elements for flexible magnetic disc cassettes.

(57) A flexible magnetic disc cassette (10) includes a cassette case (12) formed of a molded plastics material defining an interior space and a window which opens thereinto. A flexible magnetic disc having a central hub (14) is rotatably accommodated with the interior space of the cassette case such that the magnetic disc is exposed beneath said cassette case window. A shutter (16) formed of a plastics material (which may be the same or different than the plastics material form which said cassette case is formed) straddles an edge of the cassette case adjacent to its defined window. The shutter is reciprocally movable along the edge between a closed position (wherein said shutter covers the window) and an opened position (wherein the shutter exposes the window to allow access to said magnetic disc therebeneath). According to the invention disclosed herein, an elongate spring element is integrally molded (unitary) with either the cassette case or the shutter and so as to occupy a position within a corner pocket of the cassette case. The integral spring exerts a bias force against the shutter in a direction which encourages the shutter to move into its closed position.

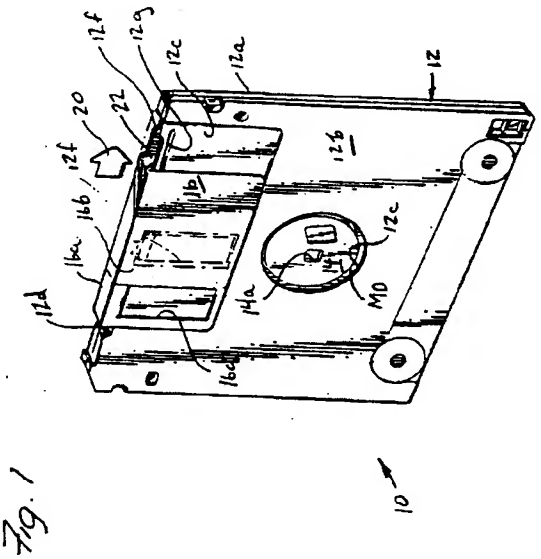


Fig. 1

EP 0 498 607 A3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 92 30 0914
Page 1

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	DE-A-3 926 997 (URBAN OTFRIED) * page 2, line 29 - line 54; claims; figures *	1,7,10, 12,19	G11B23/03
P,X	PATENT ABSTRACTS OF JAPAN vol. 15, no. 492 (P-1287)12 December 1991 & JP-A-32 12 872 (SONY) 18 September 1991 * abstract *	1-5,10, 12-17	
P,X	PATENT ABSTRACTS OF JAPAN vol. 15, no. 492 (P-1287)12 December 1991 & JP-A-32 12 873 (SONY) 18 September 1991 * abstract *	1-5,10, 12-17	
E	US-A-5 155 647 (MASATOSHI OTANI) * the whole document *	1-5,10, 12-17	
A	DE-A-3 729 241 (SCHERZ WILHELM) * column 5, line 54 - column 6, line 8; claims; figures *	1,10,12	TECHNICAL FIELDS SEARCHED (Int. Cl.5) G11B
A	US-A-4 497 009 (KENGO OISHI) * column 7, line 27 - column 8, line 27; claims; figures *	1,10,12	
A	DE-A-3 329 630 (FUJI PHOTO FILM CO) * page 11, line 12 - page 12, line 31; claims; figures *	1,10,12	
A	WO-A-8 908 312 (SYQUEST TECHNOLOGY) * page 6, line 2 - page 7, line 2; figures *	1,10,12	

-/--

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	09 MARCH 1993	SCHWANDER

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P0401)

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 92 30 0914
Page 2

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	EP-A-0 393 858 (CBM FOODCAN PLC) * column 4, line 22 - column 5, line 8; claims; figures *	1,10,12	
A	EP-A-0 201 948 (SOLVAY) * claims *	1,7-9, 10,12, 19-21	
A	PATENT ABSTRACTS OF JAPAN vol. 12, no. 316 (C-524)26 August 1988 & JP-A-63 086 711 (TORAY) * abstract *	1,7-9, 10,12, 19-21	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	09 MARCH 1993	SCHWANDER

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P0401)